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Marshall's Michelle Tillotson 'Buckling' Down on NASA's Space Launch System

By Megan Davidson

Michelle Tillotson, a stress analyst at NASA's Marshall Space Flight Center, is part of a team working to reduce costs and risks for NASA's next-generation rocket. And that's not just any rocket -- it will be the world's most powerful launch vehicle. It's called the Space Launch System.

When completed, SLS will be capable of taking a crew and cargo on deep space missions, including to an asteroid and eventually to Mars.

Tillotson is the manufacturing lead at the Marshall Center for the NASA Shell Buckling Knockdown Factor Program. In rocket science and engineering, every pound counts, and it costs to lift every pound to orbit. Rocket tanks are one of the heaviest parts of the rocket. If engineers can make tanks stronger

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TEDxHuntsville Talks Marshall Space Flight Center

On Sept. 7, team members from NASA's Marshall Space Flight Center will participate in the 6th annual TEDxHuntsville conference at Randolph School's Thurber Arts Center on Garth Road in Huntsville.

TEDxHuntsville is a local derivative of TED (Technology, Entertainment, Design), a nonprofit organization known for online talks.

Dwight Pope, a film technician in Marshall's Application, CRM & Multimedia Office, will co-host the event and Niki Werkheiser, project manager for 3D printing in zero-g in Marshall's Science & Technology Office, will discuss 3D printing capabilities being developed at Marshall.

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and lighter, rockets can carry heavier payloads to space. That's the goal of the Shell Buckling and Knockdown Factor Project, led by the NASA Engineering and Safety Center in collaboration with Marshall and teams at NASA's Langley Research Center.

"The test articles are critical to the validation of new design methods, and the benefits from this research will touch all aspects of the SLS Program by initiating reductions in the SLS core stage design cycle time, material and fabrication cost, and structural mass," said Tillotson.
The SLS core stage will stand at more than 200 feet tall with a diameter of 27.6 feet. It will store cryogenic liquid hydrogen and liquid oxygen that will feed the vehicle's RS-25 engines.

Tillotson is a native of Wilmington, Delaware. She earned a bachelor's degree in civil engineering in 2010 and a master's degree in structural engineering in 2011 from Lehigh University in Bethlehem, Pennsylvania. After working in the private industry in Allentown, Pennsylvania, for a year, she joined NASA in 2013 in the Marshall Center's Spacecraft & Vehicle Systems Department, part of the Engineering Directorate.

"I love working on this project for SLS because I am witnessing history in the making," Tillotson said. "We are taking advantage of the newer, more accurate computational methods to change the way we've been designing buckling critical components for the last 60 years. It's very exciting."

Michelle Tillotson, standing at left, and Eric Gilligan, right, speak to a crowd Aug. 24 at the Lehigh Valley Airshow in Allentown, Pennsylvania. Tillotson and Gilligan, both engineers at NASA's Marshall Space Flight Center, gave several presentations and participated in a Tweet Chat about NASA's Space Launch System during the three-day event. (NASA/MSFC)

The first flight test of the SLS in 2017 will feature a configuration for a 70-metric-ton (77-ton) lift capacity and carry an uncrewed Orion spacecraft beyond low-Earth orbit to test the performance of the integrated system. As the SLS evolves, it will provide an unprecedented lift capability of 130-metric-tons (143-tons) to enable missions even farther into our solar system.

For more information on SLS, visit here.

Davidson, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.

TEDxHuntsville *Continued from page 1*

This year's conference theme is "Elevate," providing the appropriate backdrop to highlight the innovative technologies developed at Marshall that launch science and technology into space. NASA employees and Marshall team members attending the event will receive $10 off of the registration fee by entering the code NASA. Registration is available here.

Since 2009, local professionals and residents excited about ideas worth spreading have volunteered to bring TED to the Tennessee Valley area. The team meets throughout the year, curating and planning for the annual TEDxHuntsville and TEDxYouth@Huntsville events, plus smaller intimate gatherings for livestreams and TEDTalk sessions. TEDxHuntsville is involved in bringing awareness and participation to positive, engaging, local community projects.

Eta Carinae: Our Neighboring Superstars

The Eta Carinae star system does not lack for superlatives. Not only does it contain one of the biggest and brightest stars in our galaxy, weighing at least 90 times the mass of the sun, it is also extremely volatile and is expected to have at least one supernova explosion in the future.

As one of the first objects observed by NASA's Chandra X-ray Observatory after its launch some 15 years ago, this double star system continues to reveal new clues about its nature through the X-rays it generates.

Astronomers reported extremely volatile behavior from Eta Carinae in the 19th century, when it became very bright for two decades, outshining nearly every star in the entire sky. This event became known as the "Great Eruption." Data from modern telescopes reveal that Eta Carinae threw off about 10 times the sun's mass during that time. Surprisingly, the star survived this tumultuous expulsion of material, adding "extremely hardy" to its list of attributes.

Today, astronomers are trying to learn more about the two stars in the Eta Carinae system and how they interact with each other. The heavier of the two stars is quickly losing mass through wind streaming away from its surface at over a million miles per hour. While not the giant purge of the Great Eruption, this star is still losing mass at a very high rate that will add up to the sun's mass in about a millennium.

Though smaller than its partner, the companion star in Eta Carinae is also massive, weighing in at about 30 times the mass of the sun. It is losing matter at a rate that is about a hundred times lower than its partner, but still a prodigious weight loss compared to most other stars. The companion star beats the bigger star in wind speed, with its wind clocking in almost 10 times faster.

When these two speedy and powerful winds collide, they form a bow shock -- similar to the sonic boom from a supersonic airplane -- that then heats the gas between the stars. The temperature of the gas reaches about 10 million degrees, producing X-rays that Chandra detects.

(NASA/CXC/GSFC/K. Hamaguchi, et al.)

The Chandra image of Eta Carinae shows low-energy X-rays in red, medium-energy X-rays in green, and high-energy X-rays in blue. Most of the emission comes from low- and high-energy X-rays. The blue point source is generated by the colliding winds, and the diffuse blue emission is produced when the material that was purged during the Great Eruption reflects these X-rays. The low-energy X-rays farther out show where the winds from the two stars, or perhaps material from the Great Eruption, are striking surrounding material. This surrounding material might consist of gas that was ejected before the Great Eruption.

An interesting feature of the Eta Carinae system is that the two stars travel around each other along highly elliptical paths during their five-and-a-half-year-long orbit. Depending on where each star is on its oval-shaped trajectory, the distance between the two stars changes by a factor of 20. These oval-shaped trajectories give astronomers a chance to study what happens to the winds from these stars when they collide at different distances from one another. These results were published in the April 1, 2014, issue of The Astrophysical Journal and are available online.

NASA's Marshall Space Flight Center manages the Chandra program for NASA's Science Mission Directorate. The Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, controls Chandra's science and flight operations.

Marshall Center Work Featured on TV Shows

Work taking place at NASA's Marshall Space Flight Center on the Space Launch System and advanced propulsion is being featured as part of two television series. On Aug. 27 at 8 p.m., the "How the Universe Works" series on the Discovery Science Channel will premiere "Our Voyage to the Stars." Propulsion engineer Les Johnson, deputy manager of Marshall's Advanced Concepts Office, is featured discussing current work on the SLS and advanced propulsion research such as solar sail propulsion. Filming took place at Marshall's East Test Area near Test Stand 116 where SLS acoustic testing was in progress.

The Smithsonian Channel recently aired "Space Voyages: The Moon and Beyond," which featured interviews with SLS Program Manager Todd May and SLS Chief Engineer Garry Lyles. The interviews and other footage were filmed at the Michoud Assembly Facility where SLS hardware is being built. "Space Voyages" can be viewed online here.

SLS Anti-Geysering Testing Featured on NASA-TV

Anti-geysering testing at the Marshall Space Flight Center is featured in the latest edition of "This Week @ NASA," a weekly video program broadcast nationwide on NASA-TV and posted online.

Testing ensures the liquid oxygen tank feed system of the Space Launch System (SLS) -- NASA's next heavy-lift launch rocket -- doesn't spring a leak. Geysering can happen if gas bubbles displace the liquid in the system. Engineers are using a full-scale replica of the system, set up on one of Marshall's test stands to test procedures to prevent geysering.

This and previous episodes of "This Week @NASA," are available for viewing at the NASA-TV YouTube channel.